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AUTHOR Co, Francisca K.
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ABSTRACT

This study compares the cost effectiveness of using a CD-ROM (compact disk read-only memory) system known as Bibliofile and the currently used OCLC (Online Computer Library Center)-based method to convert a university library's shelflist into a machine-readable database in the MARC (Machine-Readable Cataloging) format. The cost of each method of retrospective conversion was determined from a random sample of bibliographic records. The two systems were then compared in three areas to determine which method would be more cost effective: costs, the total time expended for editing a set of cards, and the total hit rate. The results obtained from the comparisons showed that: (1) the CD-ROM would be less expensive than OCLC in overall cost for a 5-year period; (2) there was no significant difference between the amounts of time used by each system to edit a record; and (3) OCLC had a higher hit rate. To compensate for the lower hit rate of the CD-ROM, a compensation cost was added to the CD-ROM cost; however, even with the cost adjustment, the total cost of CD-ROM was still lower than OCLC by 44%. Further investigation and study are recommended in areas such as the impact of CD-ROM on the library's workflow, its impact on the attitudes of users, the actual implementation of the CD-ROM system, and the problems and implications that would be associated with its implementation. (9 tables and 41 references) (EW)

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AN INVESTIGATION INTO THE ECONOMICS OF RETROSPECTIVE CONVERSION USING A CD-ROM SYSTEM

A Specialist Paper Submitted in Partial
Fulfillment of the Requirements
of the Specialist Certificate

by

Francisca K. Co

Faculty Committee:
James Krikelas, Chair
Charles Bunge
Richard Walker

School of Library and Information Studies
University of Wisconsin-Madison

1988

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AN INVESTIGATION INTO THE ECONOMICS OF RETROSPECTIVE CONVERSION USING A CD-ROM SYSTEM

ABSTRACT

The purpose of this study was to determine the cost-efficiency of using one CD-ROM system, known as Bibliofile, to convert a university library's shelflist file into a machine-readable database in the MARC (Machine-Readable Cataloging) format. The study discussed the current retrospective conversion procedures used by the university and the alternative method of conversion using the CD-ROM system.

Comparisons were made to the current OCLC-based method used for in-house conversion. The cost of each method of retrospective conversion was determined using the data obtained from a random sample of bibliographic records. The same basic steps were used for each procedure with the CD-ROM method simulating the existing OCLC-based method. A comparison of the system's costs, the total time expended for editing a set of cards and the total hit rate were used to determine which method, CD-ROM or OCLC, was more cost-efficient to accomplish retrospective conversion.

The results obtained from the tests showed that CD-ROM was less expensive than OCLC in the overall cost for a five-year term. The efficiency test showed that there was no significant

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difference between the amounts of time used by CD-ROM and OCLC to edit a record. However, OCLC has a higher hit rate in the second part of the efficiency test than CD-ROM. To compensate for the lower hit rate of CD-ROM in the efficiency test, compensation cost was added to the CD-ROM cost. However, with the cost adjustment, the total cost of CD-ROM was still lower than that of OCLC by 44%. The cost analysis of the two methods of retrospective conversion determined that CD-ROM was more cost-efficient as a bibliographic database for retrospective conversion.

Further investigation and study were recommended in areas such as the impact of CD-ROM in the workflow of the library system, its impact on the attitudes of the users, the actual implementation of the CD-ROM system and problems and implications that result from its implementation.

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Section 1

INTRODUCTION AND BACKGROUND

Introduction.-- CD-ROM (compact disk read-only memory) is an optical technology that offers a new medium for storing large amounts of information. It is a direct adaptation of the compact disk audio system introduced by Sony and Philips in 1980. It uses laser beams to "read" the digitally encoded information on the disk. As the name implies, the data can only be read. Once the data are written on the disk, they can not be erased or altered. CD-ROM is based on exactly the same recording techniques as CD audio. Each product applies the same modulation method and error correction techniques, and each uses the same basic player and the same 4.72-inch diameter plastic disk format. However, there is a difference in the form of data storage: CD-audio stores high fidelity music (analog) signals, while CD-ROM stores computer (digital) data. Each CD-ROM can store at least 550 megabytes of data, which is enough to hold the content of 250,000 printed pages or the contents of 1,500 floppy disks. This capacity is sufficient to store industry directories, indexes, reference books, catalogs, encyclopedias, or virtually any large collection of information.

A typical CD-ROM system consists of a microcomputer and a CD-ROM player or drive which reads the compact disk. The drive is a stand-alone unit that is attached to the computer via a cable and connected through a controller board that fits into a slot inside the computer. In addition, access software is used to drive the CD player

and handle the search and retrieval of information on CD-ROM.

The key features of the CD-ROM, which have attracted great attention in the libraries, are as follows:

-- a large storage capacity;

-- low error rates and high user accessibility;

-- a computer-based information delivery system with enhanced retrieval capabilities;

-- new workstation possibilities for users;

-- disks that can be mass-produced economically and initial costs are decreasing rapidly.

In adopting laser technology, librarians are looking to CD-ROMs for assistance in cataloging, retrospective conversion, bibliographic searching, full-text searching, and other tasks performed in technical services departments. With increased popularity of various CD-ROM systems for cataloging, librarians are reconsidering their use of OCLC (Online Computer Library Center) for retrospective conversion. It is this specific application that was addressed in this paper.

The purpose of the study reported here was to determine the cost-efficiency of using one CD-ROM system, known as Bibliofile, to convert a university library's shelflist file into a machine-readable database in the MARC (Machine-Readable Cataloging) format. Comparisons were made to the current OCLC-based method used for in-house conversion. The cost of each method of retrospective conversion was determined using data obtained from a random sample of bibliographic records. The same basic steps were used for each procedure with the CD-ROM method

simulating the existing OCLC-based method. The question to be answered was as follows: Is the cheapest method necessarily the most cost-efficient method?

Profile of the Bibliofile System.-- Bibliofile is the CD-ROM based cataloging system introduced by the Library Corporation in January, 1985. It can be used for current cataloging, for retrospective conversion, and for book acquisitions. The Bibliofile database contains over three million Library of Congress MARC records on four CD-ROM disks; the fourth disk also contains an index to the entire set. The database includes titles cataloged since 1965 -- plus "popular titles" since 1900 -- for books, serials, maps, films, music, and government publications. The database does not contain records contributed by other libraries.

The database can be searched by author, title, International Standard Book Number (ISBN), International Standard Serial Number (ISSN), Library of Congress Card Number (LCCN), and Superintendent of Documents (SuDoc) Number. The retrieved records are edited online and the results saved on a data diskette for later conversion to tape. Approximately 500 records can be saved on a diskette. The records can also be downloaded into the library's online catalog system.

Thus, Bibliofile provides a relatively easy means for building a MARC format database reflecting the holdings of a specific library. Relevant records created and edited in Bibliofile can be incorporated into OCLC. A conversion of the data diskette's internal processing

format to MARC communication's format is available under the system's "Batch Utilities." Once records are converted, they can be transmitted to other online catalog systems by using the communication set-up in the System Menu of Bibliofile.

Aside from searching for a book from the database, Bibliofile offers several other options, including printing of a set of headed catalog cards, printing spine labels, searching and retrieving the saved records from the floppy diskette, deleting the records from the diskette, and transmitting the records over a modem or communication port to another system.

Bibliofile also has a feature called "Any-Book" that can be used to identify and order books and maintain accounting information. The Any-Book database contains over 1.5 million English-language titles currently in-print, recently out-of- print, or forthcoming. Searches can be done by title, author, ISBN, or LCCN. The publication found will be displayed as an order form that includes data such as price, binding, discount, and availability. Bibliofile checks the status of the orders and also checks the status of accounts being charged. Orders are printed on standard forms and can be mailed directly to a jobber or a publisher.

The Bibliofile system requires an IBM PC/XT, M300, or IBM compatible microcomputer with at least 512 K RAM (Random Access Memory), an interface card, a connecting cable, a CD-ROM player, access software, and a set of compact disks containing the database to operate the system. The CD-ROM database can be updated monthly or quarterly on a

subscription basis. There are no transaction or telecommunication charges for the use of the system. Users can search the database for an unlimited number of hours. In the next section, a description of the retrospective conversion project at Memphis State University Libraries is presented.

Retrospective Conversion at Memphis State University Libraries.--Retrospective Conversion (RetroCon) is the process of changing the bibliographic records in a database into machine-readable format. This process usually involves the use of a bibliographic source database against which the library matches its bibliographic records and, by following a set of standards and a designated method, creates a local database for the library. Conversion approaches are most likely to be accomplished as (1) an in-house conversion with existing staff, (2) an in-house conversion with additional staff, or (3) a contracted service provided by a vendor.

The driving force of RetroCon at Memphis State University Libraries (MSU) is library automation. The immediate aim of RetroCon is to create a machine-readable database to support circulation, an online public access catalog, interlibrary loan, acquisition, a union serial list, management in their decision-making concerning the analysis of the growth and use of the collection, the production of selected bibliographies on demand, and other computer applications within the library.

The MSU library system is a member of the Southeastern Library

Network (SOLINET) and has contractual agreement with a library automation vendor, CLSI, for the installed automated library system. Although the retrospective conversion project at MSU officially began in 1979, RetroCon procedures have been modified over the years based on needs of changing library automation systems and equipment. The necessary modifications were adopted mainly to increase the output productivity of RetroCon and to eliminate some of the inconsistencies associated with the past RetroCon practices. As of 1988, approximately 485,000 titles had been converted to machine-readable form. The following section describes the present conversion procedures.

Current Retrospective Conversion Procedures.-- Conversion of bibliographic records into machine-readable form at MSU was done in-house using the existing staff and some additional staff through SOLINET/OCLC. The standards adhered to were the Anglo- American Cataloging Rules, second edition (AACR2) for cataloging, Library of Congress classification number, LC subject headings (LCSH), and MARC format for the coding of records. The information contained in the shelflist was used as the basis for conversion. The editing of records was done online directly on the OCLC terminal. The current RetroCon procedures are as follows:

1. The library assistant takes one shelflist drawer to the OCLC terminal. Each card in the drawer is checked to determine its acceptability by skipping cards such as these: those with OCLC numbers written on the top right-hand corner of the card, which

means that they have been retrospectively converted; cards originally produced at OCLC, identifiable by the OCLC control number appearing at the bottom line of a card and by the typeface; serials; open entry cards; MSU theses, and other cards that cannot be found in the OCLC database.

2. The record is searched in OCLC and verified that it matches exactly the information found in the shelflist card based on author, title, edition, publisher, date of publication, or copyright date.

3. After verification that the exact record has been found, the assistant writes the OCLC number on the top right-hand corner of the card. If more than one matching record is found, a Library of Congress record (DLC) should be used if available; otherwise, the one which most closely matches MSU's records should be used. If no matching record is found, original cataloging will be done by the catalogers in the department.

4. Editing and entering (keying) of data is based on the information found on the shelflist card. Each field on the record should correspond to the shelflist card on hand. When editing the record, fixed fields are ignored and only the following five fields are edited:

    a). Field 020 - International Standard Number.
    The price of the item is recorded after the ISBN number. If an ISBN is present on the shelflist card, it should be included in the record used for

conversion.

b). Field 090 - Call number.

Call numbers are entered based on LC Classification Schedules, but assigned locally. If the call number on the shelflist card does not match the call number on the record, the record is edited to match the shelflist card.

c). Field 049 - Holdings data.

The appropriate holding library symbol is recorded according to the location stamp on the card, either above or below the call number. If no specific library symbol is present, the main library symbol is used. The correct number of copies, volumes, and parts are included in this field.

d). Field 590 - Shelflist information note.

The library's shelflist information is recorded directly from the shelflist card. Phrases such as "lost," "missing,"or "withdrawn" should be included to show the books's exact status. If all copies on the shelflist have been lost or withdrawn, the editing should be skipped.

e). Field 949 - Holdings for incomplete serials, monographic series and multi-volume sets.

This field is included anytime the shelflist card shows that the number of volumes or sets the library

has in a monographic series or multi- volume set is less than what the OCLC record indicates.

5. After the editing is finished, the library assistant types the reformat command (rf) and double checks all the editing made on the screen. After the assistant presses the UPDATE and SEND keys; one record has been updated and retrospectively converted.

Streamlining the Specifications.-- A decision was made to streamline the specifications; to edit only fields 020, 090, 049, 590 and 949, and to ignore the fixed fields and other important access points for authority work. This was necessary in order to speed up the conversion process. These changes resulted in an increased number of records being handled during the study. Streamlining the specifications during editing was seen as one of the ways to keep the level of production high and to meet the deadline for the authority control conversion by Blackwell North America (BNA). In the next section, the shortcomings, or problems, in the RetroCon procedures are presented.

Shortcomings in the Retrospective Conversion Procedures.-- Any library operation procedures that are implemented can not avoid some inconsistencies, problems, and shortcomings. These are due to the changes in library policies and practices as well as to the rapid changes occurring in library technology. This is particularly true in the technical services area where cataloging rules and practices have

been modified over the years. The retrospective conversion project at MSU was no exception to this malady. Two areas that merited attention are as follows:

1. Quality of the database

   Due to complex regulations for hiring regular staff to do RetroCon, most of the clerical work of data entry was done by student assistants. Furthermore, time pressures limited the amount of training that could be offered. The trade-off in this kind of staffing and working situation was between quantity and quality. As a result of the inadequate training and the lack of quality checking procedures, consistent errors were found in the bibliographic records in the database. In addition, some errors were sufficiently subtle as to escape notice; for example, the main library's holding symbol (TMAA) was used when the Engineering library's holding symbol (TMAO) should have been used. Another example was in the formatting of call numbers without any spacings. These kinds of errors were corrected only when seen by observant library assistants; undetected data errors remained present in the database and continue to cause confusion to users of the online catalog.

2. Authority control

   There was no attempt at authority control during the conversion process. The decision, made in the past, of not imposing authority control still haunts the database operation. As a result, there is inconsistency in the file,

such as different versions of the same name and of series titles. This oversight will be corrected when the new library system (CL-CAT from CLSI Inc.) is implemented and the library's data tapes are matched against the BNA's data tapes, the series and names headings of which have been mechanically converted by BNA's authority control system. With this new implementation, the library will be able to maintain its own in-house authority database and bibliographic record database system.

CD-ROM Procedure in Retrospective Conversion.-- These same basic steps used in OCLC were used in retrospective conversion in Bibliofile: searching, verification, editing and saving the record. Bibliofile's retrospective conversion procedure operated in the following way:

1. The library assistant placed the number four disk, containing the index of the database where the searching of records should begin, on the tray of the CD-ROM player.
2. The assistant searched for the record by pressing the function key, "F1." Normally, searching was done under author, title, or author/title. If a title was not found, other options of searching under LCCN, ISBN, ISSN, GPO were used.
3. The retrieved record was verified if it matched the shelflist card. Searching continued, and if a record was found in disk number four, "F3" was pressed to edit the record at that time. Editing included the fields 020, 090, 049, 590 and 949. After

the record was edited, "F9" was pressed to save the record on the data diskette. These records were later downloaded into the online catalog system. If no matched record was found, the message Hitcount = 0 was shown on the screen. In this case, it was necessary to do original cataloging for the item, based on the data from the shelflist card. "F5" was pressed to create an original MARC format record.

4. For those records found on disk number 1, 2, and 3, the records were saved to the disk queue for later editing. At this time, the library assistant wrote the numbers 1, 2, 3 on the shelflist cards in order to group the cards by numbers to facilitate the editing process by lessening the number of times the disks need to be changed.
5. After the search on the disks for all the shelflist card records was finished, disk number 4 was removed from the tray and the records were retrieved one by one from the queue on disk numbers 1, 2, and 3 successively. Then, the records were searched to call up each record on the appropriate disk. Finally, the records were edited and saved on the data diskette.

Cost Analysis of CD-ROM System and OCLC.-- The options in retrospective conversion continue to increase as technology advances. The newest approach is based on compact disks. A CD-ROM based system uses a microcomputer and a CD-ROM player to access a large bibliographic data

file. This system has changed the traditional method of RetroCon of using OCLC since it supports offline conversion without telecommunication charges and provides a low-cost option for RetroCon.

Cost analysis offers a method to evaluate the CD-ROM technology. The research question asked in this study was this: Will the use of a CD-ROM system be an effective method to accomplish RetroCon with a minimum of time and cost? A comparison of the systems' costs, the total time expended for editing a set of cards, and the total hit rate were used to determine which method, CD- ROM or OCLC, was less expensive and faster for carrying out a retrospective conversion.

The null hypothesis (Ho) was the following: The time needed to edit a set of cards in retrospective conversion using CD-ROM is approximately the same as the time used under OCLC.

Three elements in the systems were examined in the analysis: cost, efficiency, and cost-efficiency. But, before analyzing these three elements, a look at the assumptions and limitations of this study was necessary. Assumptions were made on the following points:

1. A sample of ninety (90) shelflist cards was randomly selected by using the Random Number Generating Table of IMSL's (International Mathematical and Statistical Libraries, Inc.) subroutine program.
2. The two library assistants who participated in the test have comparable library skills and levels of experience in retrospective conversion. Each of them edited three sets of fifteen cards on both systems. The test was performed

independently, without any interaction. Based on these conditions, the data collected were normal, independent, and unbiased.

3. The yearly costs were assumed to be constant on a linear relationship. There were no sudden or unforseen changes in the costs.

The scope and generalizability of this study were limited in the following ways:

1. Material processed - Only monographs were covered. This was primarily due to the use of library assistants for the study, and they normally do not do editing of serials and of audio-visual materials, nor do they do original cataloging.
2. Labor cost may vary yearly - It is possible for the library assistants to get a raise due to merit and promotion. Assuming a regular turnover, which is common among students, the percentage of raise was not included in the five-year term since it would be approximately the same for each method.
3. Software updates - The updates are accounted for in the first year only, with the five remaining years not included.

Section 2a

COST ANALYSIS

Costs for CD-ROM and OCLC were broken down into fixed cost and yearly cost. The fixed cost generally included the equipment and other peripherals, while the yearly cost included those for the maintenance and the labor which incurred on a yearly basis. Table 1 and Table 2 indicate the fixed cost and yearly cost of each system.

Table 1

FIXED COST OF CD-ROM AND OCLC

CD-ROM	
Application software and user manual, one set of the LC MARC and Any-Book databases on laser disks	$ 1,750.00
CD-ROM drive and cable	680.00
Application software updates, toll-free 800-line support,and hardware maintenance	540.00
Zenith ZSM-159-13, 640 K memory	1,399.00
Epson LQ-1000 printer	1,248.00
TOTAL	$ 5,617.00

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OCLC	
M-310 terminal	$ 3,224.00
Printer	1,248.00
TOTAL	$ 4,472.00

Table 2

YEARLY COST OF CD-ROM AND OCLC

CD-ROM	
Maintenance cost	
LC MARC English language disks, subscription (quarterly)	$ 870.00
LC MARC Foreign language disks subscription (quarterly)	500.00
Conversion of diskettes to MARC tape, (Approximately 15,000 records converted/tape @ $10/5,000 records)	30.00
Sub-total	$ 1,400.00
Labor cost	
2 library assistants @ $13,881.60/year	27,763.20
TOTAL	$29,163.20
OCLC	
Maintenance cost	
Dues	$ 400.00
System service	2,016.00
Terminal maintenance	3,456.00
Telecommunication network service	780.00
Station terminator	2,340.00
Leased telephone line	1,500.00
Archive tape @ $116.93/mo.	1,403.16
RetroCon : non-prime time OCLC charges, ($0.30/title x 12,000 titles/yr.)*	3,600.00
Searching ($1,747.90 x 40.38% retrocon)*	705.80
Display holding : cataloging, ($15.49 x 40.38% retrocon)*	6.25
Sub-total	$16,207.21
Labor cost	
2 Library assistants @ $13,881.60/year	27,763.20
TOTAL	$43,970.41

*OCLC charged $0.30 per title for conversion during non-prime time and approximately 12,000 titles were retrospectively converted per year. Retrospective conversion constituted 40.38% of the total titles searched and cataloged. Statistics for the maintenance cost on OCLC were provided by Dr. Philip Smith, Head of the Catalog Department at Memphis State University Libraries.

A period of five years was the time frame for this study. Table 3 reflects the costs that were incurred by the two systems over the 5-year period. The cost for five years was obtained by multiplying the yearly cost of each system by five. In order to get the total cost for the 5-year term, the fixed cost was added to the five-year cost.

Table 3

TOTAL COST FOR 5-YEAR TERM OF CD-ROM AND OCLC

	CD-ROM	OCLC
Fixed cost	$ 5,617.00	$ 4,472.00
5-year cost	145,816.00	219,852.05
Total	$ 151,433.00	$ 224,324.05

A percentage difference on cost was taken for the 5-year term based on the CD-ROM system. The percentages are shown in Table 4.

Table 4

FIVE-YEAR TERM WITH PERCENTAGE DIFFERENCE ON COST

	CD-ROM	OCLC	% difference*
Fixed cost	$ 5,617.00	$ 4,472.00	-20.38%
1-Year costs	29,163.20	43,970.41	+50.77%
5-Year costs	145,816.00	219,852.05	+50.77%
Fixed+5 Years	$151,433.00	$224,324.05	+48.13%

*Comparison of OCLC versus CD-ROM costs.

Analysis of Cost.-- When fixed costs were compared, the fixed cost incurred in using CD-ROM was 20.38% higher than that incurred in using OCLC. Assuming that the yearly cost follows a linear trend, the first year cost of OCLC was 50.77% more than CD-ROM's. Therefore, in the 5-year term, OCLC's cost was about 2.5 times greater than CD-ROM's. Assuming a time frame of 5 years, the total cost for 5 years will be the fixed cost plus the yearly costs for the 5 years. Given these assumptions, OCLC still costs 48.13% more than CD-ROM over the five-year period.

Conclusion of cost.-- The initial cost for CD-ROM was higher than that of OCLC, but in five years, the overall cost of CD-ROM was lower than that of OCLC; this implied that CD-ROM was more economical in the 5-year term analysis. In the next two sections of this paper, discussions on efficiency and cost-efficiency with analysis, implications and conclusions drawn from each part are presented.

Section 2b

EFFICIENCY ANALYSIS

For the purpose of this study, efficiency was defined as the capacity of the system to achieve a better performance in RetroCon as measured by a comparison of actual results in total editing time and total hit rate. Two kinds of tests were performed for the efficiency test: (1) total editing time and (2) hit rate.

Total Editing Time Analysis

The time spent in editing included updating the records, changing the fields, and adding new fields to the records. All updating was done during non-prime time hours to obtain the lowest cost possible on OCLC. The total editing time used for each case on the two systems is shown in Table 5. A t-statistics was computed to test the difference between the two systems in the mean time used to edit each card and tested at the 95% significance level. (see Table 6).

Table 5

TOTAL EDITING TIME USED ON EACH SET OF 15 CARDS

	CD-ROM		OCLC	
Case	No. of Cards	Time (hr.)	No. of Cards	Time (hr.)
1	11	0.40	15	0.58
2	10	0.38	15	0.42
3	15	0.48	15	0.38
4	11	0.38	15	0.48
5	7	0.43	15	0.45
6	7	0.38	15	0.43

Table 6

MEANS AND STANDARD DEVIATIONS
FOR THE TWO METHODS
(FOR 6 CASES)

Method	Mean	Standard Deviation
CD-ROM	.0428 hr.	.012 hr.
OCLC	.0304 hr.	.002 hr.

Analysis of Editing Time Efficiency.-- The efficiency test was performed by two library assistants using six sets of cards on CD-ROM and OCLC. The same six sets of 15 cards each were used on each system with assistant A using 3 of the sets of 15 cards and assistant B using the other 3 sets of 15 cards. A sample of 90 cards was selected at random from the shelflist, using the Random Number Generating Table of IMSL's subroutine program. The two assistants performed their jobs independently. They followed the RetroCon procedures for each system. Timing started with searching the record in the database and ended after the record was saved in the system. The time used to finish editing each set of 15 cards was measured in terms of hours.

The null hypothesis stated that the time needed to edit a record in both systems was equal. The t-test showed that $t_{(df=5)} = 2.26$; a p-value = 0.07 > 0.05. Therefore, the test failed to reject Ho, and the conclusion was that there is no significant difference between the two methods in terms of the total time used in editing at the 95% significance level.

Total Hit Rate Analysis

The hit rate is the proportion of books to be entered as holdings in the database, and for which an existing database record will be found. The size of the database affects the hit rate of a system; this means that the larger the database, the higher the hit rate. Table 7 indicates the number of hits and misses for cards edited on CD-ROM.

Table 7

NUMBER OF HITS AND MISSES FOR EACH SET OF CARDS EDITED ON CD-ROM

Case	Hits (Match)	Misses (No Match)
1	11	4
2	10	5
3	15	0
4	11	4
5	7	8
6	7	8

A frequency table (Table 8) indicates the average number of hits and misses on both systems. The average number of misses in CD-ROM was 5 for all six cases, while the average number of hits was 10. In OCLC cases, all records were found in the database, and the hit rate was 100%.

Table 8

FREQUENCY TABLE ON THE NUMBER OF HITS AND MISSES

Average Number of	CD-ROM	OCLC	Total
Hits	10	15	25
Misses	5	0	5

A set of test statistics on average hit rate was computed: Pearson Chi-square, Yates Corrected Chi-square, and the Fisher Exact test (1-tail and 2-tail) for significance. Fisher's Exact test was used because of the small calculated "expected values" on the Chi-square test.

Analysis of the Hit Rate.-- Using Fisher's (2-tail) test, the calculated statistic (Pearson Chi-square = 6.000 and Yates Chi- square = 3.840) indicated that the difference between the two systems was statistically significant at the 95% level, (p-value = 0.042 < 0.05). Furthermore, the 1-tail test statistic was significant at the 0.05 level, (probability value = 0.211 < 0.05), and this supported the contention that the expected hit rate of OCLC was truly greater than that of the CD-ROM.

Conclusions of the Hit Rate Analysis.-- The results of the test performed showed that the expected hit rate in CD-ROM was less than the expected hit rate in OCLC, $P_{(CD\text{-}ROM)} < P_{(OCLC)}$. The hit rate of CD-ROM in this finding was lower than that of OCLC, because OCLC has a larger database than CD-ROM. The version of CD-ROM used in this study contained only over 3 million of Library of Congress' MARC records in its database but did not contain records contributed by other libraries, while OCLC has a database of 17 million records contributed by member libraries. This means that larger libraries will find using CD-ROM a disadvantage due to its lower hit rate.

Section 2c

COST-EFFICIENCY

Cost-efficiency is the degree of task achievement realized with a minimum expenditure of cost. Using cost and effectiveness as two separate measures, a table of preferences was constructed (see Table 9).

The process indicated that for fixed cost, OCLC was less expensive than CD-ROM but more expensive in terms of yearly cost. For the total 5-year term cost, CD-ROM was also preferred. In the efficiency test based on time, neither method was superior but OCLC was the method of preference because of its high hit rate in the test.

Table 9

COST-EFFICIENCY TABLE

Category	Comparison	Preference
Efficiency		
1. Time	OCLC = CD-ROM	Either
2. Hit rate	OCLC > CD-ROM	OCLC
Cost		
1. Fixed	OCLC < CD-ROM	OCLC
2. Yearly	OCLC > CD-ROM	CD-ROM
3. Total cost	OCLC > CD-ROM	CD-ROM

Cost-efficiency Analysis.-- In the first part of the efficiency test, the t-test statistics showed that there is no significant difference in the average editing time, i.e., $X_{(CD\text{-}ROM)} = X_{(OCLC)}$. In the second part, using the expected hit rate the test statistics showed that OCLC had a higher hit rate than CD- ROM, i.e., $P_{(CD\text{-}ROM)} < P_{(OCLC)}$, which meant OCLC was better in the efficiency test. In order to make the systems more comparable, there was a need to estimate the cost necessary to compensate for the loss in efficiency in CD-ROM method. The following was the computation for that adjustment:

(1) % hit rate (CD-ROM) = 10/15 x 100% = 66.67%

where, 10 is the average hit in CD-ROM out of 15;

(2) compensation cost for efficiency computed =

474 titles/yr x (100% -66.67%) x Y

where, 474 titles = number of titles done for original cataloging in RetroCon per year and Y = cost per original cataloging based on 0.5 hr. = average time to do original cataloging plus $12 = cost of labor to do an original cataloging per hour. Therefore, Y = 0.5 x 12 = $6.00

Therefore, CD-ROM compensation cost = 474 x (100% - 66.67%) x 6

= $947.91/year and the 5-year cost = $4,739.53

Thus, the total cost needed to compensate for the number of misses in the CD-ROM method was $4,739.53. This would increase the original 5-year cost of the CD-ROM system from $151,433 to $156,172.53. Even with this cost adjustment, the total cost in the 5-year term for CD-ROM was still lower than OCLC.

Section 3

SUMMARY AND CONCLUSIONS

This paper examined cost analysis of two methods of retrospective conversion under CD-ROM (Bibliofile) and OCLC. After examining the cost, efficiency, and cost-efficiency of both systems, the researcher found that CD-ROM was less expensive than OCLC in the overall cost for a five-year term. The efficiency test showed that there was no statistically significant difference between the amounts of time required by CD-ROM and OCLC to edit a record. However, OCLC has a higher hit rate in the second part of the efficiency test than CD-ROM. In order to have the same comparison basis for both systems, cost was used to compensate for the lower hit rate of CD-ROM in the efficiency test. This method eliminated the preference of either system in the hit rate. The compensation cost was added to the CD-ROM cost, and the decision on which system is more cost-efficient was decided based on the cost factor. With the cost adjustment, the total cost of CD-ROM was still lower than that of OCLC by 44%. Therefore, from the results of the tests, the researcher concluded that as a bibliographic database for retrospective conversion, CD-ROM was more cost-efficient.

The yearly cost outlined in this study showed that retrospective conversion with OCLC will cost more than with CD-ROM. However, the high hit rate of OCLC's bibliographic database will allow the library to find more records in its collection and meet cataloging needs.

Factors to Consider.-- Factors affecting the decision-making process may alter the selection of a cost-efficient system. After performing the cost analysis, the researcher solved the major problem of choosing the more cost-efficient system to carry out a conversion project. But the more efficient method does not necessarily mean the better choice. The following factors may affect the choice of a system:

1. The higher yearly cost of OCLC may prevent the smaller libraries with limited budgets from using this system for retrospective conversion.
2. Ease of training in using CD-ROM. The library assistant needs to know only the basics of DOS (Disk operating system) and the function keys of the CD-ROM system, because the editing procedures follow the same steps as in OCLC.
3. The cost of CD-ROM can be reduced. Prices on equipment will tend to go down every year because the number of users of the CD-ROM system is increasing; therefore, the initial higher fixed cost of CD-ROM will go down to a point where it will be equal to or less than OCLC's initial fixed cost.
4. Administrative policy and decision. Because a library's policies are not always made on the basis of objective, scientific information, the administrator may prefer to keep the existing system and not change to CD-ROM.

5. Preference by the librarian or the administrator for efficiency. If the librarian, staff, or administrator puts more weight on the editing time, then CD-ROM is the better choice, since editing time is the same for both systems and the CD-ROM is less expensive over a 5-year term. However, if the librarian prefers a high hit rate, then OCLC is the better choice even if it costs more. Thus, time-efficiency may be preferred over cost-efficiency by some users.
6. Popularity of the system. OCLC has been in existence for more than ten years and is widely known as the traditional online bibliographic system in most libraries. However, just because OCLC is the oldest or most familiar system to the users, it is not necessarily the best.

The findings of this study will be helpful to the library policy decision-maker(s) in choosing which system to use for retrospective conversion. However, the method that a library administrator selects for its retrospective conversion project will also depend on the richness of the database, funds available, library policy, and many other conditions and factors. Whichever method is chosen, CD-ROM will play a significant part in the retrospective conversion process for the libraries in the near future.

Further studies need to be undertaken to determine the impact of CD-ROM in such areas as the following: its effectiveness in the workflow of the library system, its impact on the attitudes of the

users, and other areas that may critically affect the integration of the new technology into the library automation efforts. Issues such as the actual implementation, problems, and implications of the CD-ROM system will also require further investigation and study.

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